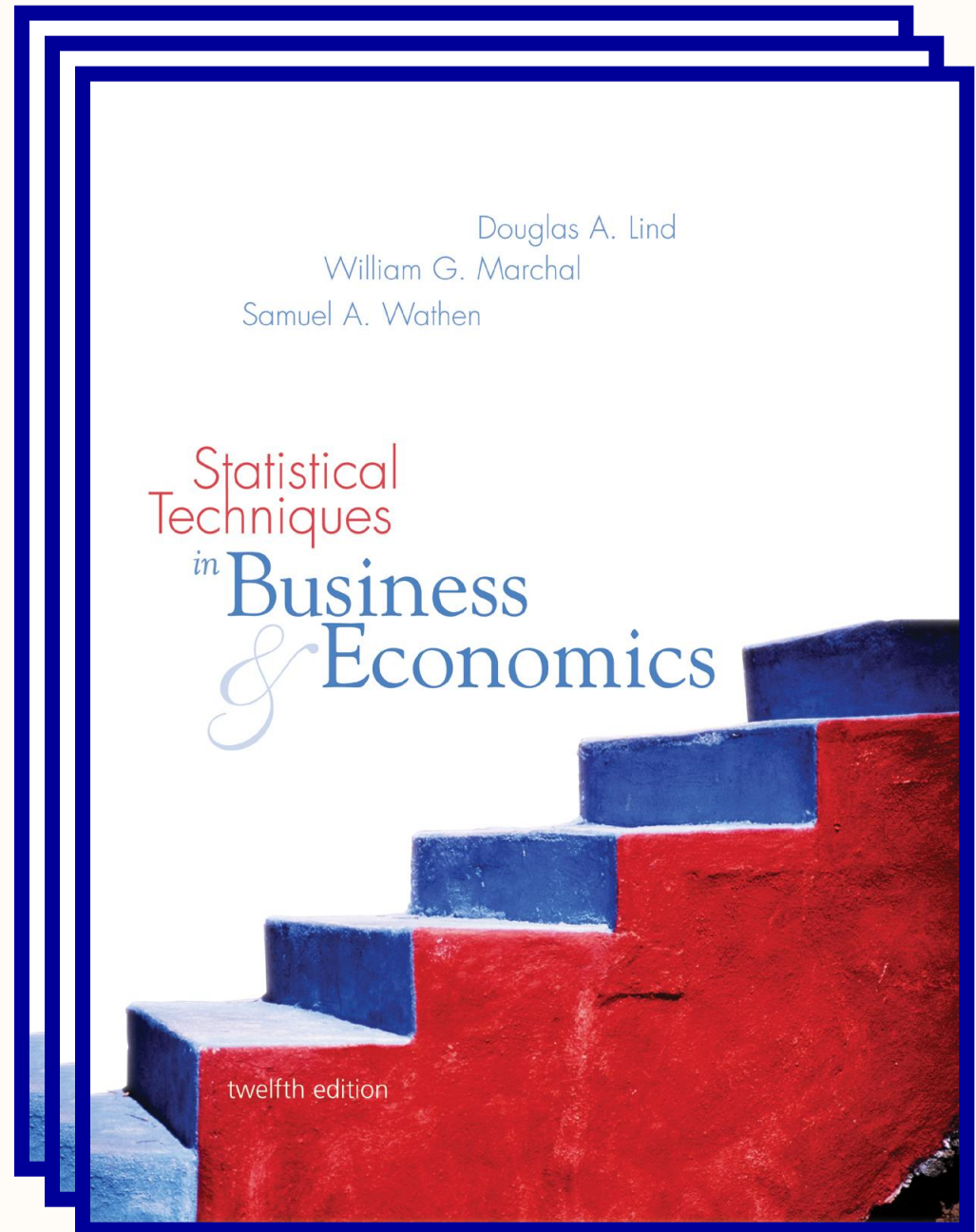


Chapter

Two

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Chapter Two

Describing Data: Frequency Distributions and Graphic Presentation

GOALS

When you have completed this chapter, you will be able to:

ONE

Organize data into a frequency distribution.

TWO

Portray a frequency distribution in a histogram, frequency polygon, and cumulative frequency polygon.

THREE

Present data using such graphic techniques as line charts, bar charts, and pie charts.

A Frequency Distribution is a grouping of data into mutually exclusive categories showing the number of observations in each class.

Constructing a frequency distribution involves:



Determining the question to be addressed

Constructing a frequency distribution

Constructing a frequency distribution involves:



Collecting raw data

Determining the question to be addressed

Constructing a frequency distribution

Constructing a frequency distribution involves:



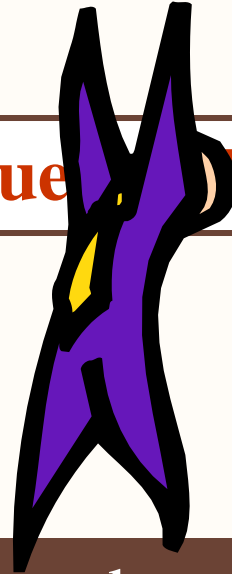
Organizing data (frequency distribution)

Collecting raw data

Determining the question to be addressed

Constructing a frequency distribution

Constructing a frequency distribution involves:



Presenting data (graph)

Organizing data (frequency distribution)

Collecting raw data

Determining the question to be addressed

Constructing a frequency distribution

Constructing a frequency distribution involves:

Drawing conclusions

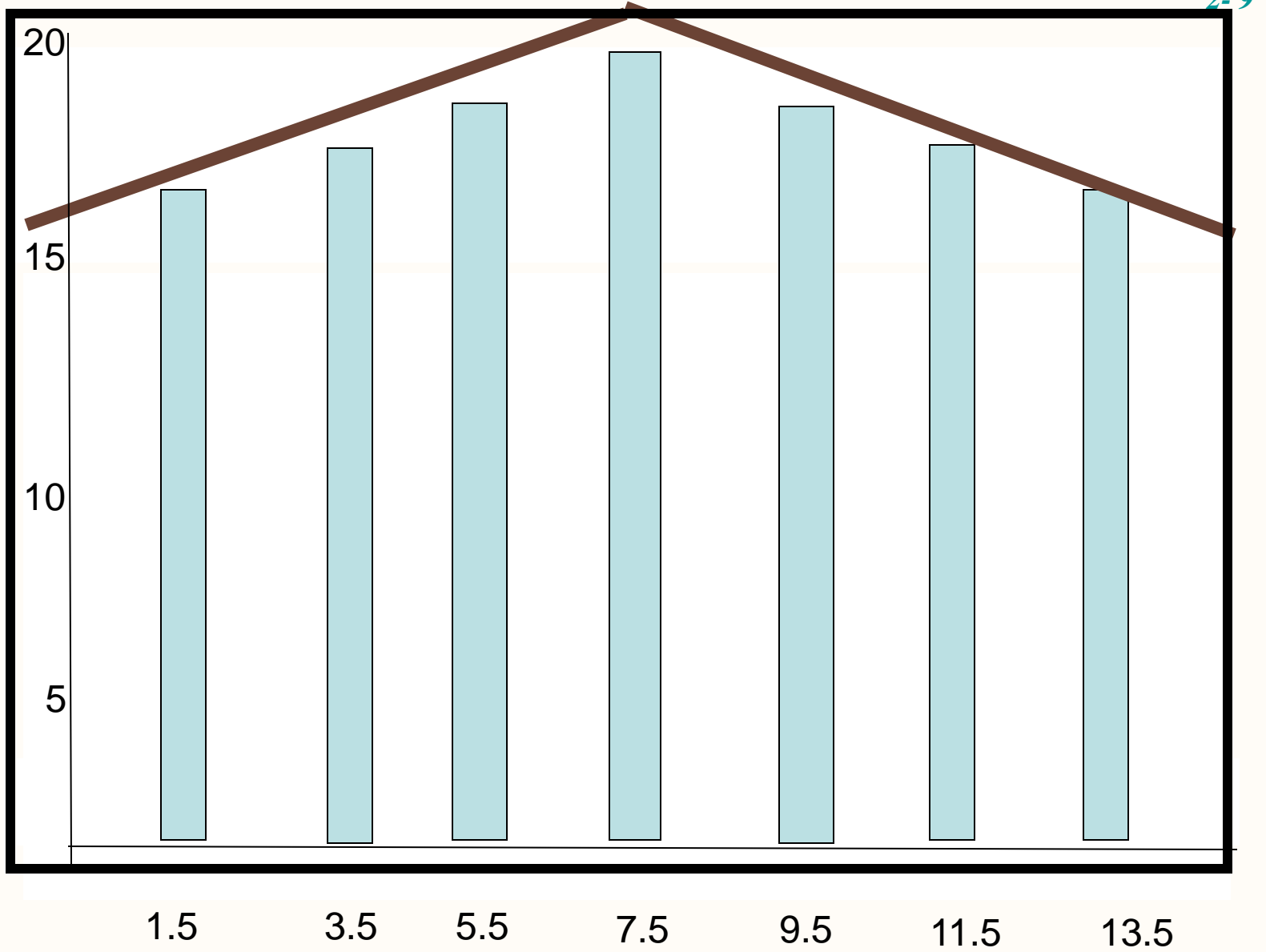
Presenting data (graph)

Organizing data (frequency distribution)

Collecting raw data

Determining the question to be addressed





Constructing a frequency distribution

Class Midpoint: A point that divides a class into two equal parts. This is the average of the upper and lower class limits.

Class Frequency:
The number of observations in each class.

Class interval: The class interval is obtained by subtracting the lower limit of a class from the lower limit of the next class. The class intervals should be equal.

Dr. Tillman is Dean of the School of Business Socastee University. He wishes prepare to a report showing the number of hours per week students spend studying. He selects a random sample of 30 students and determines the number of hours each student studied last week.

15.0, 23.7, 19.7, 15.4, 18.3, 23.0, 14.2, 20.8, 13.5,
20.7, 17.4, 18.6, 12.9, 20.3, 13.7, 21.4, 18.3, 29.8,
17.1, 18.9, 10.3, 26.1, 15.7, 14.0, 17.8, 33.8, 23.2,
12.9, 27.1, 16.6.

Organize the data into a frequency distribution.

Step One: Decide on the number of classes using the formula

$$2^k > n$$

where k=number of classes

n=number of observations

oThere are 30 observations so n=30.

oTwo raised to the fifth power is 32.

oTherefore, we should have at least 5 classes, i.e., k=5.

Step Two: Determine the class interval or width using the formula

$$i \geq \frac{H - L}{k} = \frac{33.8 - 10.3}{5} = 4.7$$

where H =highest value, L =lowest value

Round up for an interval of 5 hours.

Set the lower limit of the first class at 7.5 hours, giving a total of 6 classes.

Step Three: Set the individual class limits and
Steps Four and Five: Tally and count the number of items in each class.

Hours studying	Frequency, f
7.5 up to 12.5	1
12.5 up to 17.5	12
17.5 up to 22.5	10
22.5 up to 27.5	5
27.5 up to 32.5	1
32.5 up to 37.5	1

Class Midpoint: find the midpoint of each interval,
use the following formula:

$$\frac{\text{Upper limit} + \text{lower limit}}{2}$$

Hours studying	Midpoint	f
7.5 up to 12.5	$(12.5+7.5)/2 = 10.0$	1
12.5 up to 17.5	$(17.5+12.5)/2 = 15.0$	12
17.5 up to 22.5	$(22.5+17.5)/2 = 20.0$	10
22.5 up to 27.5	$(27.5+22.5)/2 = 25.0$	5
27.5 up to 32.5	$(32.5+27.5)/2 = 30.0$	1
32.5 up to 37.5	$(37.5+32.5)/2 = 35.0$	1

A Relative Frequency Distribution shows the percent of observations in each class.

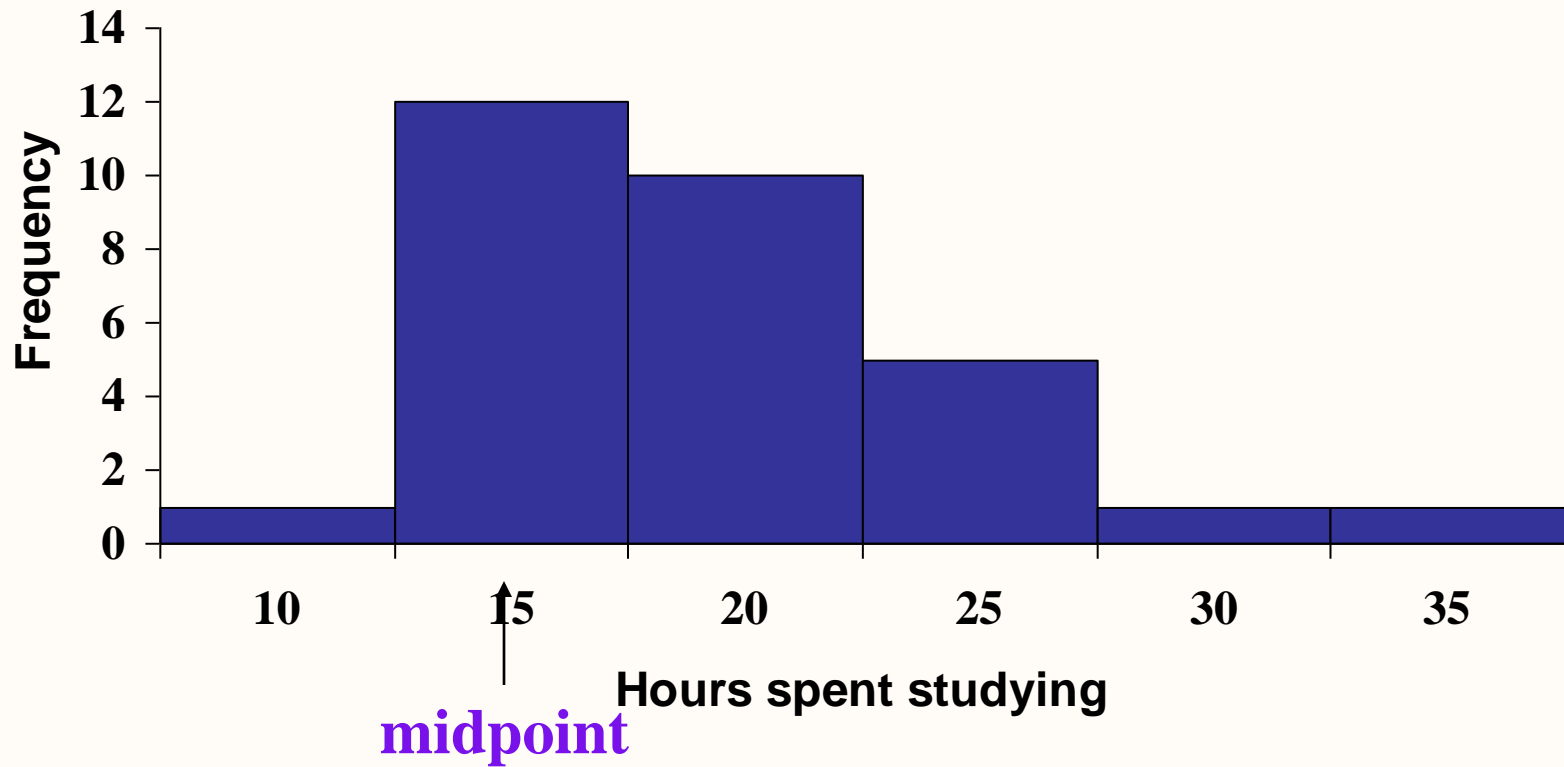
Hours	f	Relative Frequency
7.5 up to 12.5	1	$1/30=.0333$
12.5 up to 17.5	12	$12/30=.400$
17.5 up to 22.5	10	$10/30=.333$
22.5 up to 27.5	5	$5/30=.1667$
27.5 up to 32.5	1	$1/30=.0333$
32.5 up to 37.5	1	$1/30=.0333$
TOTAL	30	$30/30=1$

The three commonly used graphic forms are **Histograms, Frequency Polygons**, and a **Cumulative Frequency** distribution.

A **Histogram** is a graph in which the class midpoints or limits are marked on the horizontal axis and the class frequencies on the vertical axis.

The class frequencies are represented by the heights of the bars and the bars are drawn adjacent to each other.

Graphic Presentation of a
Frequency Distribution

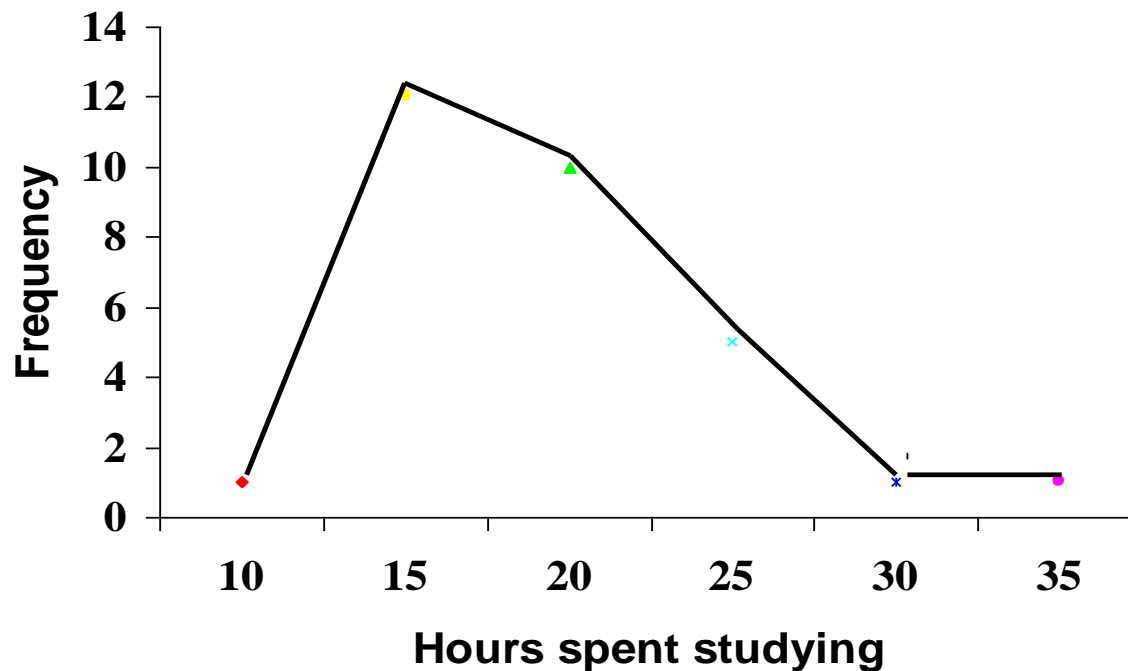


Histogram for Hours
Spent Studying

Graphic Presentation of a Frequency Distribution

A **Frequency Polygon** consists of line segments connecting the points formed by the class midpoint and the class frequency.

Frequency Polygon for Hours Spent Studying



Cumulative Frequency Distribution

A **Cumulative Frequency Distribution** is used to determine how many or what proportion of the data values are below or above a certain value.

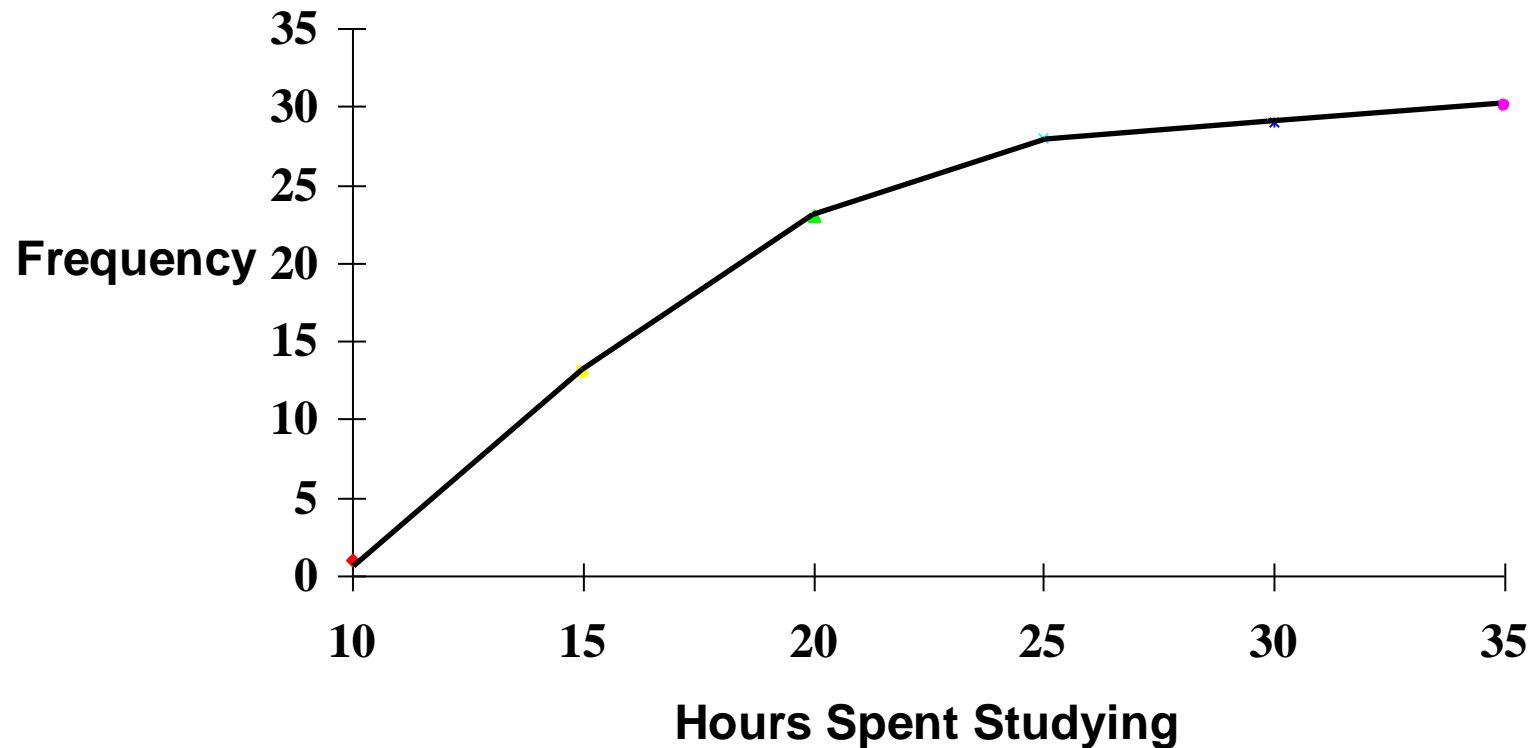
To create a cumulative frequency polygon, scale the upper limit of each class along the X-axis and the corresponding cumulative frequencies along the Y-axis.

Cumulative Frequency Table for Hours Spent Studying

Hours Studying	Upper Limit	f	Cumulative Frequency
7.5 up to 12.5	12.5	1	1
12.5 up to 17.5	17.5	12	13 (1+12)
17.5 up to 22.5	22.5	10	23 (13+10)
22.5 up to 27.5	27.5	5	28 (23+5)
27.5 up to 32.5	32.5	1	29 (28+1)
32.5 up to 37.5	37.5	1	30 (29+1)

Cumulative frequency table

Cumulative Frequency Distribution For Hours Studying

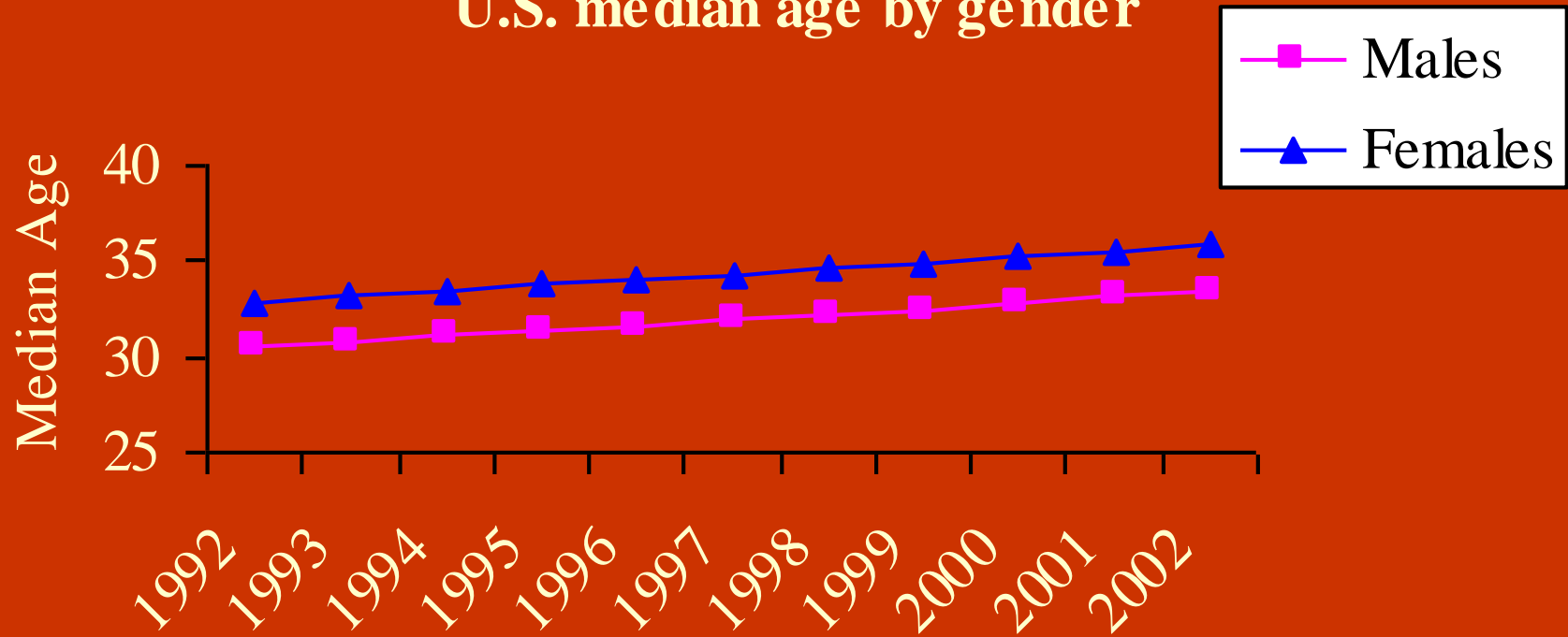


Cumulative frequency distribution

Line graphs are typically used to show the change or trend in a variable over time.

Year	Males	Females
1992	30.5	32.9
1993	30.8	33.2
1994	31.1	33.5
1995	31.4	33.8
1996	31.6	34.0
1997	31.9	34.3
1998	32.2	34.6
1999	32.5	34.9
2000	32.8	35.2
2001	33.2	35.5
2002	33.5	35.8

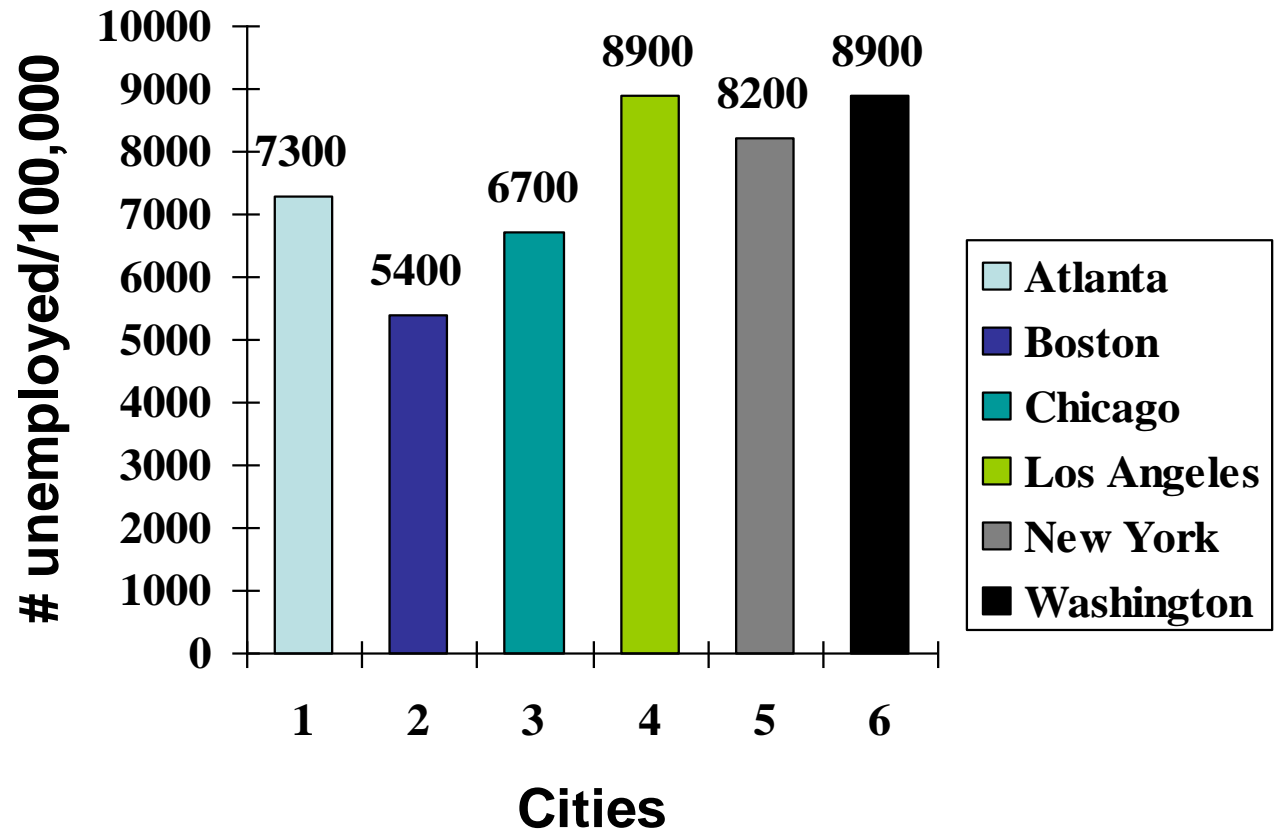
U.S. median age by gender



A **Bar Chart** can be used to depict any of the levels of measurement (nominal, ordinal, interval, or ratio).

Construct a bar chart for the number of unemployed per 100,000 population for selected cities during 2001

City	Number of unemployed per 100,000 population
Atlanta, GA	7300
Boston, MA	5400
Chicago, IL	6700
Los Angeles, CA	8900
New York, NY	8200
Washington, D.C.	8900



Bar Chart for the Unemployment Data

A Pie Chart is useful for displaying a relative frequency distribution. A circle is divided proportionally to the relative frequency and portions of the circle are allocated for the different groups.

A sample of 200 runners were asked to indicate their favorite type of running shoe. Draw a pie chart based on the following information.

Type of shoe	# of runners	% of total
Nike	92	46.0
Adidas	49	24.5
Reebok	37	18.5
Asics	13	6.5
Other	9	4.5

Pie Chart for Running Shoes

